



BEAN TUNNEL

TECHNICAL NOTE

DFL-UK

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PROJECT NUMBER: 1551		DOCUMENT REF: 1551-DFL-ELG-XX-RP-EO-13001			
P01	First issue	DS	AS	AS	15/12/2024
Revision	Purpose Description	Originated	Checked	Approved	Date

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1. INTRODUCTION

- 1.1.1. This Technical Note has been written by DFL (Designs for Lighting Ltd¹), a lighting design consultancy specialising in Lighting Impact Assessments, obtrusive light mitigation, and detailed lighting design.
- 1.1.1. The purpose of this Technical Note is to respond to questions raised by Kent County Council (KCC) Ecology Advice Service (EAS):

“Ecology Advice Service matters:

Operational lighting impacts

A clear plan has not been submitted demonstrating the anticipated horizontal and vertical light spill of the proposal. The light spill report does provide some plans which show the existing and anticipated operational lighting when it is switched off and on however the plans are not clear. We recommend that a more detailed plan, showing the existing and anticipated lighting levels (both horizontal and vertical light levels) are provided to ensure the impact of the proposed lighting can be understood.

Please provide information to confirm the operational hours of the proposal and if there will be periods when the lights are switched off or dimmed.

Construction Lighting Impacts

Bats may be impacted by an increase in lighting during the construction period. Regarding lighting the tunnel, the ecological impact assessment has detailed the following:

For lighting required in Tunnel 2 for pedestrian and light plant use, it is proposed that motion sensor lighting or a timer is used to minimise potential impact to bats. This type of lighting would be activated via motion and turn off after a short period of time of inactivity. Motion activated sensors could be installed at set intervals throughout the tunnel and be lit at levels no greater than 5 lux. Regarding the colour of lighting used, there is evidence to suggest common pipistrelle species are unaffected by white light, however it is recommended that headlights utilised on-site have a red-light setting which can be used if required. External lighting design for Tunnel 2 will should be consulted with the ecologist in order to mitigate the effects of lighting on the tunnels and the surrounding habitat.

The EAS questions if either of these two options are achievable within a construction site. EAS understand that the tunnel is to be used by both pedestrians and vehicles and therefore there will be minimum requirements to ensure that there is no risk of accidents occurring within the site. It may be more practical for a low-level lighting to be operational constantly during the working hours which will then increase in brightness when the motion sensors are triggers. If motion

¹ <https://www.dfl-uk.com/about/>

sensors are triggered the timings must be based on the maximum time it takes for a pedestrian to walk through the tunnel. Any lighting in the tunnel must only be operational during the working construction hours.

Please can you provide further information to clarify the proposed construction lighting arrangements.

Would the proposed lighting only be operated during the working construction hours and how would the motion sensors and timers be used in practice during the construction period.”

2. OPERATIONAL LIGHTING IMPACTS

- 2.1.1. The KCC EAS has requested further information on the operational impacts including both horizontal and vertical light spill details comparing the existing and proposed lighting.
- 2.1.2. The 3D modelling that has been completed and that was present within the document 1551-DFL-ELG-XX-RP-EO-13001 shows this much clearer than any lighting plan could. This is because the images of the 3D model show the illuminance levels on all surfaces surrounding the tunnel rather than on horizontal or vertical calculation grids.
- 2.1.3. This means the calculated illuminance on the surfaces is clearly visible, rather than being presented on an abstract calculation grid.
- 2.1.4. Images of the 3D modelling have been included on the next page with annotation for clarity.
- 2.1.5. **Figure 1** shows the Proposed Tunnel with the operational lighting switched on. The resulting illuminance on all surfaces is shown using a colour scale, with the key also shown in the figure.
- 2.1.6. **Figure 2** shows the Proposed Tunnel with the operational lighting switched off. This model therefore shows the effects of the existing lighting only. As with **Figure 1**, the resulting illuminance on all surfaces is shown using a colour scale, with the key also shown in the figure.

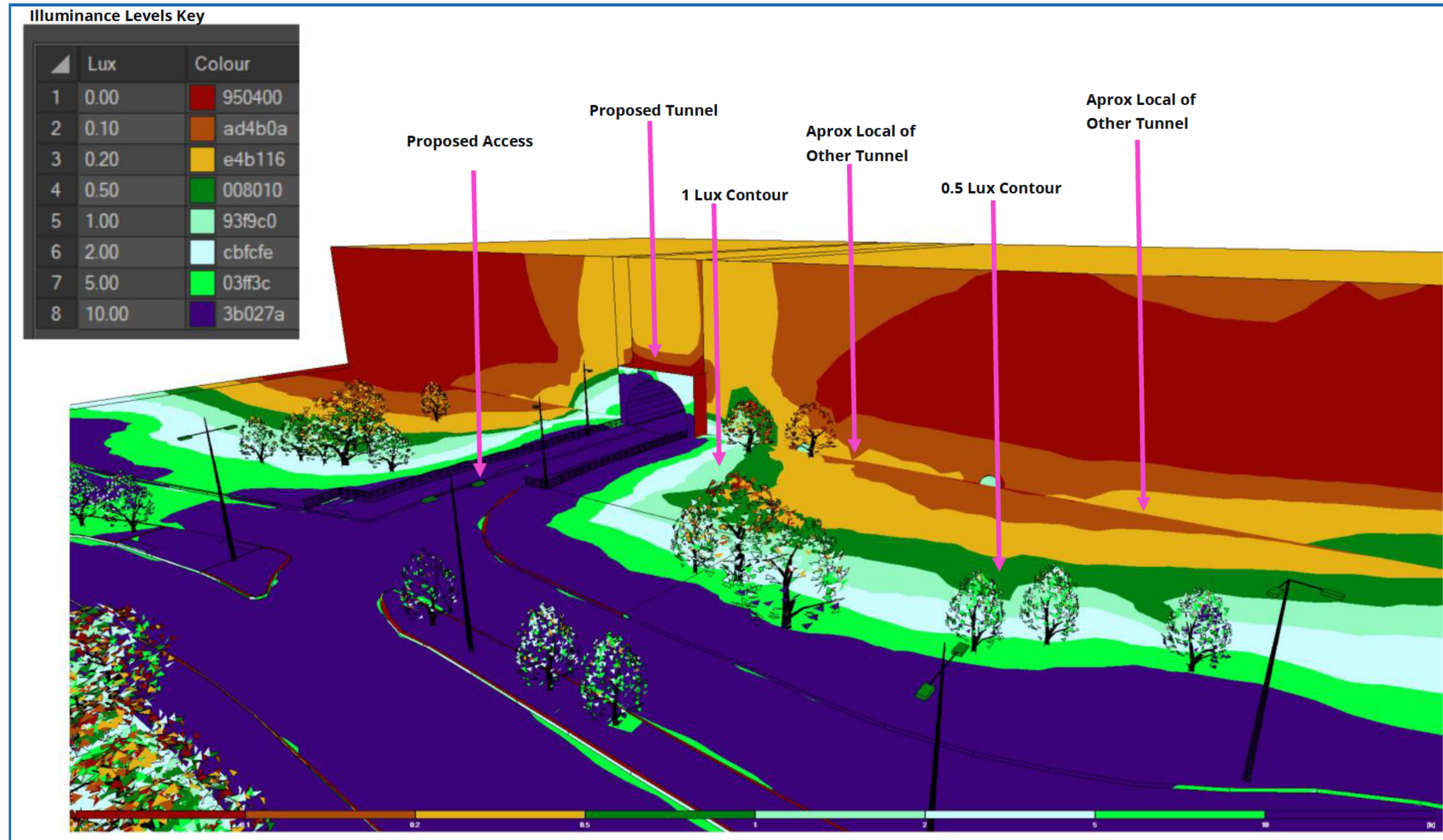


Figure 1: Post occupation lighting levels (Lighting Switched On)

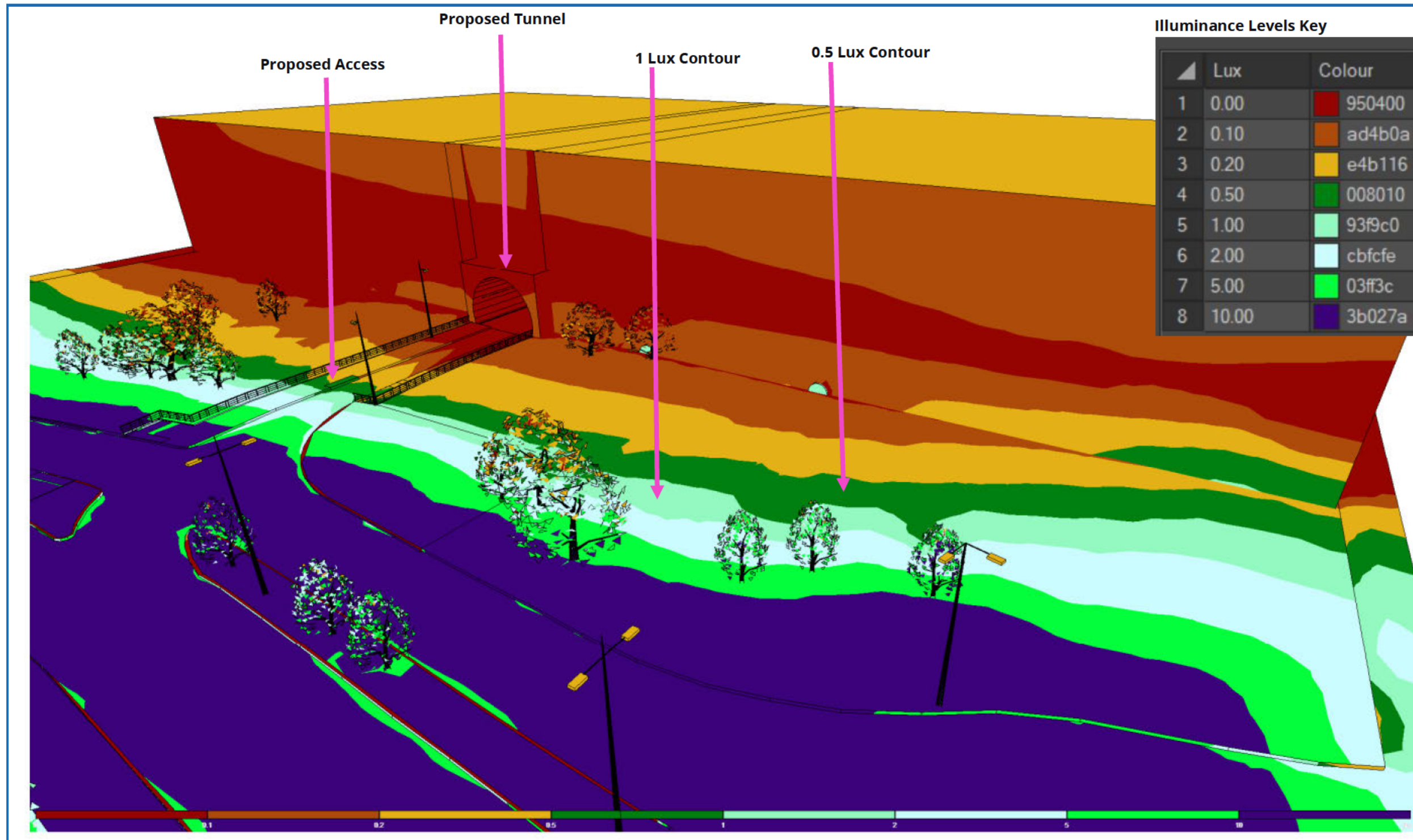


Figure 2: Post occupation lighting levels (Lighting Switched Off)

- 2.1.7. As can be seen in **Figure 1** and **Figure 2**, the effects of the proposed lighting will be limited to the proposed tunnel and the access road. Illuminance levels quickly drop to ≤ 0.5 Lux either side of the roadway.
- 2.1.8. It should be noted that the lighting of tunnels requires very particular ratios of illuminance. This is to ensure those using the tunnel in vehicles can see both inside and outside the tunnel while using the passageway. The primary use of this lighting is to ensure that the eye can adapt properly to the new lighting conditions – therefore failing to light properly can lead to an increase in accidents.
- 2.1.9. The correct method for lighting tunnels is detailed within BS 5489-1:2020 and BS 5489-2:2016.
- 2.1.10. The operational hours of the proposed lighting will be dependent on the lighting specification of the Local Highway Authority, and is proposed for 24hr use. However, there are different illuminance standards for tunnels during the day and night, and the night-time illuminance levels are significantly lower than the day.

3. CONSTRUCTION LIGHTING IMPACTS

- 3.1.1. The comments from KCC Ecological Advice Service are addressed below:

“For lighting required in Tunnel 2 for pedestrian and light plant use, it is proposed that motion sensor lighting or a timer is used to minimise potential impact to bats. This type of lighting would be activated via motion and turn off after a short period of time of inactivity. Motion activated sensors could be installed at set intervals throughout the tunnel and be lit at levels no greater than 5 lux. Regarding the colour of lighting used, there is evidence to suggest common pipistrelle species are unaffected by white light, however it is recommended that headlights utilised on-site have a red-light setting which can be used if required. External lighting design for Tunnel 2 will should be consulted with the ecologist in order to mitigate the effects of lighting on the tunnels and the surrounding habitat.

The EAS questions if either of these two options are achievable within a construction site. EAS understand that the tunnel is to be used by both pedestrians and vehicles and therefore there will be minimum requirements to ensure that there is no risk of accidents occurring within the site. It may be more practical for a low-level lighting to be operational constantly during the working hours which will then increase in brightness when the motion sensors are triggers. If motion sensors are triggered the timings must be based on the maximum time it takes for a pedestrian to walk through the tunnel. Any lighting in the tunnel must only be operational during the working construction hours.

Please can you provide further information to clarify the proposed construction lighting arrangements.

Would the proposed lighting only be operated during the working construction hours and how would the motion sensors and timers be used in practice during the construction period.”

- 3.1.2. Due to the need for construction tasks to be undertaken within the tunnel and the need for vehicles and pedestrian to move through the tunnel, the use of motion sensor lighting would not be considered safe during construction working hours.
- 3.1.3. The minimum illuminance levels for construction tasks (including on traffic routes on construction sites) are detailed in BS EN 12464-2:2024. Dimming below these levels would not be compliant with Health and Safety Executive (HSE) recommendations.
- 3.1.4. There are also specific lighting requirements for tunnels, which are detailed within BS 5489-1:2020 and BS 5489-2:2016, which would also need to be met by the construction lighting when the tunnel is in use by vehicles and pedestrians.
- 3.1.5. However, no construction task lighting will be left on outside of the working hours of construction.
- 3.1.6. After construction activities have finished for the day, the lighting could then be controlled by motion sensors for security purposes. This would allow security personal to identify any intruders into the construction site as the active lighting would follow them around the construction site, but would mean that any effects of lighting on bats can be reduced by turning off lighting that is not required to be on all night.
- 3.1.7. Construction lighting will use the following mitigation measures as standard:

Mitigation Name	Description of Mitigation
Restricting the Upward Light Output Ratio	All luminaires will have an Upward Light Output Ratio of 0%.
Restricting Luminaire Tilt	All luminaires will be installed with a 0° tilt as standard. An allowance to tilt luminaires to 5° may be made, where it is demonstrated that: 1. This is required to achieve a standard lighting level on the task or area, and 2. This will not result in any significant effects on the surrounding receptors.
Installation of Back Light Shielding	Where luminaires are installed on the perimeters of areas being lit they will be installed with back light shields.
Using the lowest applicable lighting levels for tasks and areas	All areas and task will be lit using the lowest applicable lighting levels are defined in the relevant British Standard. This will ensure a standard and recognised level of light is provided for all areas of the construction site, while ensuring no area is over lit.

Mitigation Name	Description of Mitigation
Using the minimum practical mounting height	All luminaires will be mounted at the minimum practical mounting height for the area or task. This will also help ensure there is minimum need to tilt luminaires, by providing enough height for the light to travel forward into the task area.
Construction lighting will be switch off after the working hours	All construction task lighting will be turned off after the hours of work and the site has been vacated. Security lighting may be used; however this will be controlled by motion sensors.

Table 1: Construction Lighting Mitigation

- 3.1.8. Additional mitigation for the protection of bats during the construction phase of the Proposed Development will be decided through liaison with a qualified ecologist.

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- **Public Realm** teams that are experts in enhancing night-time public spaces to create inviting spaces and opportunity for local economies to thrive during the hours of darkness.
- **Electrical** teams – we don't just put a light in the ground, we can help you get power to it as well! Additionally, we also offer design services for EV charging. As this market rapidly expands, make sure you have the experts managing the load, otherwise your EV charging solutions might not live up to expectations.
- **Strategic Infrastructure** teams that offer Lighting and Electrical expertise for complex transport networks and interchanges.
- **Consultancy Services** teams that help when you know what you want but you need someone to help you turn the idea into a project.

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THE POWER TO MAKE LIGHT WORK



Senior Engineer



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